Observations on Charilaus and Charilainae (Orthoptera, Pamphagidae)

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Examination of specimens of *Charilaus carinatus* Stål (Metsimaklaba, Bechuanaland Protectorate) has shown that certain phallic structures have been misinterpreted in published descriptions. The most serious errors are those pertaining to the cingulum. Dirsh (1956: 241) described the cingulum as "consisting of a pair of robust, strongly sclerotised apodemes, not connected in zygoma region, but curving downwards and joining ventral part of arch of cingulum; they are connected posteriorly by transverse bar (in the genus *Charilaus* only). Zygoma absent, but in its place, on internal side of apodemes, a pair of small but robust sclerites connected with apodemes, but not with each other. Rami are completely absent. Arch of cingulum connected proximally with both branches of apodemes and forming distally two pairs of complicated cingular valves, which represent the functional apex of the aedeagus." Actually, the zygoma is present and was figured by Dirsh (1956: Pl. 15, C, "Scl"). The zygoma is continuous with other parts of the cingulum; the lines in Dirsh's figure that seem to separate it from the rest of the cingulum are merely the edges of ridges on the ventral surface of the apodemes and rami. The "small robust sclerites" (Dirsh, 1956: Pl. 15, C and E, "Ascl") "in the position of the zygoma" are the suprarami. The normal position of the zygoma is along the anterior edge of the middorsal region of the infold that produces the cingulum. In the case of *Charilaus,* the apodemes are greatly reduced, and the zygoma is found near the anterior end of the cingulum. The rami are not absent; they are the largest parts of the cingulum. As explained by Eades (1961a) the arch in the Acrididae (*s. str.*) is not part of the cingulum, but the "arch of cingulum" in the Charilainae *is* part of the cingulum and is not homologous with the true arch.

In *Charilaus* there are three pairs of lobes that Dirsh (1956) called "valves of cingulum." (All three pairs are shown in

Plate 15, figures B, D, and H; but the medial pair was omitted in figures E, F, and I.) The best way to determine homologies of valves is by sclerites that extend into them. The medial pair of valves contain the distal portions of the aedeagal sclerites (apical valves of penis in part of Dirsh), but they do not contain any of the cingulum. Therefore, the medial pair of valves should be called *aedeagal valves;* they are homologous with the aedeagal valves in the Pamphaginae (see Roberts, 1941) and probably with the aedeagal valves in the Ommexechinae (see Eades, 1961b). The other two pairs of valves in *Charilaus* contain distal extensions of the rami, and Dirsh's "valves of cingulum" is a suitable term for them. However, it should be noted that the valves of cingulum in *Charilaus* are not homologous with the valves of cingulum in Pyrgomorphidae (where they are associated with the suprarami) or with structures in the Acrididae (*s. str.*) that have erroneously been called "valves of cingulum" (see Eades, 1961a). "Valves of cingulum" has also been used in the Proscopiidae, but the homology here is not clear.

The shape of the endophallic sacs as shown by Dirsh (1956: Pl. 15, J) is erroneous. Superposition of his figures F and J would indicate that the right and left gonopore processes are fully fused. Actually, the ejaculatory sac and the spermatophore sac are continuous between the gonopore processes. The spermatophore sac is dorsal to the ejaculatory sac, but no more so than in the Pamphaginae.

The lateral extremes of the ventro-lateral appendices of the epiphallus in the Charilainae occupy the same position on the ectophallic membrane as the oval sclerites in other groups, and there is an internal dorso-lateral surface appropriate for the attachment of the retractor of the phallus (muscle 261 of Snodgrass, 1935). Therefore, it is reasonable to conclude that the oval sclerites are fused to the epiphallus, not absent as indicated by Dirsh (1961: 356). The same is true for the Pyrgomorphidae.

The "Charilaidae" supposedly differ from the "Pamphagidae" in the following characters (compiled from Dirsh, 1953, 1954,

1956, 1957, and 1961): 1) median carina of pronotum double, 2) outer side of hind femur with regular fish-bone pattern, 3) wing-elytron stridulatory mechanism present, 4) spermatheca with apical and preapical diverticula, 5) cingulum with apodemes separated, 6) zygoma absent, 7) rami absent, 8) arch of cingulum present, 9) endophallic sclerites not articulated, 10) spermatophore sac markedly dorsal in position, and 11) epiphallus with ventro-lateral appendices. As pointed out above, characters 5, 6, 7, and 10 are erroneous. Character 2 occurs in the "Pamphagidae" (see Dirsh, 1961: 374, fig. 9, drawing 1). Characters 3 and 8 do not occur in all Charilainae. The presence of the additional diverticulum of the spermatheca (character 4) is very little different from the lateral bulges found in some "Pamphagidae." Character 9, which could be more accurately stated "endophallic sclerites only narrowly articulated," is a relatively minor difference. Character 11 is valuable, but it does not have great phylogenetic significance. The "Pamphagidae" are the only members of the Acrididae (sense of Roberts, 1941) that lack the oval sclerites. Therefore, the difference between "Charilaidae" and "Pamphagidae" is almost certainly a degenerative loss in "Pamphagidae." This leaves only the double median carina of the pronotum (character 1), which is an important character but not sufficient justification for family rank. Thus the Charilainae must be reinstated as a subfamily within the Pamphagidae.

Literature Cited

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